6. An apparatus according to claim 2, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube.

7. An apparatus according to claim 2, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube, and wherein said Time-of-Flight mass analyzer is configured for orthogonal pulsing of said ions from said pulsing region into said Time-of-Flight tube.

8. An apparatus according to claim 2, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube, and wherein said Time-of-Flight mass analyzer is configured for in-line pulsing of said ions from said pulsing region into said Time-of-Flight tube.

9. An apparatus according to claim 2, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube, and wherein said Time-of-Flight mass analyzer includes an ion trap for pulsing of said ions from said pulsing region into said Time-of-Flight tube.

10. An apparatus according to claim 2, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

11. An apparatus according to claim 2, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

12. An apparatus according to claim 2, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

13. An apparatus for analyzing chemical species, comprising:

(a) an ion source;

(b) a Time-Of-Flight mass analyzer having a pulsing region; and,

(c) a multipole ion guide.

14. An apparatus according to claim 13, wherein said multipole ion guide is a hexapole.

15. An apparatus according to claim 13, wherein said multipole ion guide is a quadrupole.

16. An apparatus according to claim 13, wherein said multipole ion guide has more than four poles.

17. An apparatus according to claim 13, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

18. An apparatus according to claim 13, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

19. An apparatus according to claim 13, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

20. An apparatus for analyzing chemical species, comprising:

(a) an ion source for operation at substantially atmospheric pressure;

(b) a Time-Of-Flight mass analyzer; and,

(c) a multipole ion guide.

21. An apparatus according to claim 20, wherein said ion source is an Electrospray ion source.

22. An apparatus according to claim 20, wherein said ion source is an Electrospray ion source with pneumatic nebulization assist.

23. An apparatus according to claim 20, wherein said ion source is an Atmospheric Pressure Chemical Ionization source.

24. An apparatus according to claim 20, wherein said ion source is an Inductively Coupled Plasma ion source.

25. An apparatus according to claim 20, wherein said multipole ion guide is a hexapole.

26. An apparatus according to claim 20, wherein said multipole ion guide is a quadrupole.

An apparatus according to claim 19, wherein said multipole ion guide has more than four poles.

An apparatus according to claim 19, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube.

An apparatus according to claim 19, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube, and wherein said Time-of-Flight mass analyzer is configured for orthogonal pulsing of said ions from said pulsing region into said Time-of-Flight tube.

An apparatus according to claim 19, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube, and wherein said Time-of-Flight mass analyzer is configured for in-line pulsing of said ions from said pulsing region into said Time-of-Flight tube.

An apparatus according to claim 19, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube, and wherein said Time-of-Flight mass analyzer includes an ion trap for pulsing of said ions from said pulsing region into said Time-of-Flight tube.

An apparatus according to claim 19, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

An apparatus according to claim 19, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

An apparatus according to claim 19, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

An apparatus for analyzing chemical species, comprising:

(a) an ion source for operation at substantially atmospheric pressure;

(b) a Time-Of-Flight mass analyzer having a pulsing region; and,

(c) a multipole ion guide.

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36. An apparatus according to claim 35, wherein said ion source is an Electrospray ion source.

37. An apparatus according to claim 35, wherein said ion source is an Electrospray ion source with pneumatic nebulization assist.

38. An apparatus according to claim 35, wherein said ion source is an Atmospheric Pressure Chemical Ionization source.

39. An apparatus according to claim 35, wherein said ion source is an Inductively Coupled Plasma ion source.

40. An apparatus according to claim 35, wherein said multipole ion guide is a hexapole.

41. An apparatus according to claim 35, wherein said multipole ion guide is a quadrupole.

42. An apparatus according to claim 35, wherein said multipole ion guide has more than four poles.

43. An apparatus according to claim 35, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

44. An apparatus according to claim 35, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

45. An apparatus according to claim 35, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

46. An apparatus for analyzing chemical species, comprising:

(a) an ion source for producing ions;

(b) a Time-Of-Flight mass analyzer having a pulsing region; and,

(c) at least one multipole ion guide, said multipole ion guide being positioned such that said ions produced in said ion source can move into said pulsing region of said Time-Of-Flight mass analyzer after moving through said at least one multipole ion guide.

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47. An apparatus according to claim 46, wherein said ion source is an Electrospray ion source.

48. An apparatus according to claim 46, wherein said ion source is an Electrospray ion source with pneumatic nebulization assist.

49. An apparatus according to claim 46, wherein said ion source is an Atmospheric Pressure Chemical Ionization source.

50. An apparatus according to claim 46, wherein said ion source is an Inductively Coupled Plasma ion source.

51. An apparatus according to claim 46, wherein said multipole ion guide is a hexapole.

52. An apparatus according to claim 46, wherein said multipole ion guide is a quadrupole.

53. An apparatus according to claim 46, wherein said multipole ion guide has more than four poles.

54. An apparatus according to claim 46, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

55. An apparatus according to claim 46, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

56. An apparatus according to claim 46, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

57. An apparatus for analyzing chemical species, comprising:

(a) an ion source for operation at substantially atmospheric pressure;

(b) a vacuum region, said vacuum region comprising at least two vacuum stages;

(c) a multipole ion guide, said multipole ion guide being located in said vacuum region;

(d) a Time-Of-Flight mass analyzer and detector comprising a pulsing region and being configured for orthogonal pulsing, said Time-of-Flight mass analyzer being located in at least one of said vacuum stages.

58. An apparatus according to claim 57, wherein said ion source is an Electrospray ion source.

59. An apparatus according to claim 57, wherein said ion source is an Electrospray ion source with pneumatic nebulization assist.

60. An apparatus according to claim 57, wherein said ion source is an Atmospheric Pressure Chemical Ionization source.

61. An apparatus according to claim 57, wherein said ion source is an Inductively Coupled Plasma ion source.

62. An apparatus according to claim 57, wherein said multipole ion guide is a hexapole.

63. An apparatus according to claim 57, wherein said multipole ion guide is a quadrupole.

64. An apparatus according to claim 57, wherein said multipole ion guide has more than four poles.

65. An apparatus according to claim 57, wherein the background pressure in said region is high enough to cause collisional cooling of ions as they transverse said ion guide.

66. An apparatus according to claim 57, wherein the background pressure in said region is high enough to cause collisional kinetic energy cooling of ions as they transverse said ion guide.

67. An apparatus according to claim 57, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

68. An apparatus according to claim 57, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

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69. An apparatus according to claim 65, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

70. An apparatus for analyzing chemical species, comprising:

(a) an ion source for operation at substantially atmospheric pressure;

(b) a vacuum region comprising vacuum stages, said vacuum region comprising at least two of said vacuum stages;

(c) at least two multipole ion guides, each of said multipole ion guides being located in said vacuum region;

(d) a Time-Of-Flight mass analyzer and detector located in at least one of said vacuum stages.

71. An apparatus according to claim 70, wherein said Time-Of-Flight mass analyzer further includes a pulsing region and is configured for orthogonal pulsing.

72. An apparatus according to claim 70, wherein said multipole ion guide is positioned such that said ions produced in said ion source can move into said pulsing region of said Time-Of-Flight mass analyzer after moving through said at least one multipole ion guide.

73. An apparatus according to claim 70, wherein said ion source is an Electrospray ion source.

74. An apparatus according to claim 70, wherein said ion source is an Electrospray ion source with pneumatic nebulization assist.

75. An apparatus according to claim 70, wherein said ion source is an Atmospheric Pressure Chemical Ionization source.

76. An apparatus according to claim 70, wherein said ion source is an Inductively Coupled Plasma ion source.

77. An apparatus according to claim 70, wherein at least one of said multipole ion guides is a hexapole.

78. An apparatus according to claim 70, wherein each of said multipole ion guide is a quadrupole.

79. An apparatus according to claim 70, wherein each of said multipole ion guide has more than four poles.

80. An apparatus according to claim 70, wherein the background pressure in said region is high enough to cause collisional cooling of ions as they transverse said ion guide.

81. An apparatus according to claim 70, wherein the background pressure in said region is high enough to cause collisional kinetic energy cooling of ions as they transverse said ion guide.

82. An apparatus according to claim 70, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

83. An apparatus according to claim 70, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

84. An apparatus according to claim 70, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.

85. An apparatus for analyzing chemical species, comprising:

(a) an ion source for producing ions from a sample substance;

(b) a vacuum region, said vacuum region comprising at least one vacuum stage, said vacuum stage being in communication with said ion source such that said ions produced by said ion source can move from said ion source through said vacuum stage;

(c) a multipole ion guide located in said vacuum region, at least a portion of said multipole ion guide being located in an area within said vacuum region wherein the background pressure is sufficiently high such that multiple collisions occur between ions and background gas in said area;

(d) a Time-Of-Flight mass analyzer and detector located in said vacuum region.

An apparatus according to claim 84, wherein the background pressure in said region is high enough to cause collisional cooling of ions as they transverse said ion guide.

An apparatus according to claim 84, wherein the background pressure in said region is high enough to cause collisional kinetic energy cooling of ions as they transverse said ion guide.

An apparatus according to claim 84, wherein said ion source is an Electrospray ion source.

An apparatus according to claim 84, wherein said ion source is an Electrospray ion source with pneumatic nebulization assist.

An apparatus according to claim 84, wherein said ion source is an Atmospheric Pressure Chemical Ionization source.

An apparatus according to claim 84, wherein said ion source is an Inductively Coupled Plasma ion source.

An apparatus according to claim 84, wherein said multipole ion guide is a hexapole.

An apparatus according to claim 84, wherein said multipole ion guide is a quadrupole.

An apparatus according to claim 84, wherein said multipole ion guide has more than four poles.

An apparatus according to claim 84, wherein said Time-of-Flight mass analyzer and detector comprises an ion pulsing region and a Time-of-Flight tube.

An apparatus according to claim 84, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1.5 millimeters.

An apparatus according to claim 84, wherein the radial distance from the inner surface of a pole of said multipole ion guide to the centerline of said multipole ion guide is not greater than 1 millimeter.

An apparatus according to claim 84, wherein said multipole ion guide has an inner diameter which is no greater than 2.5 millimeters.